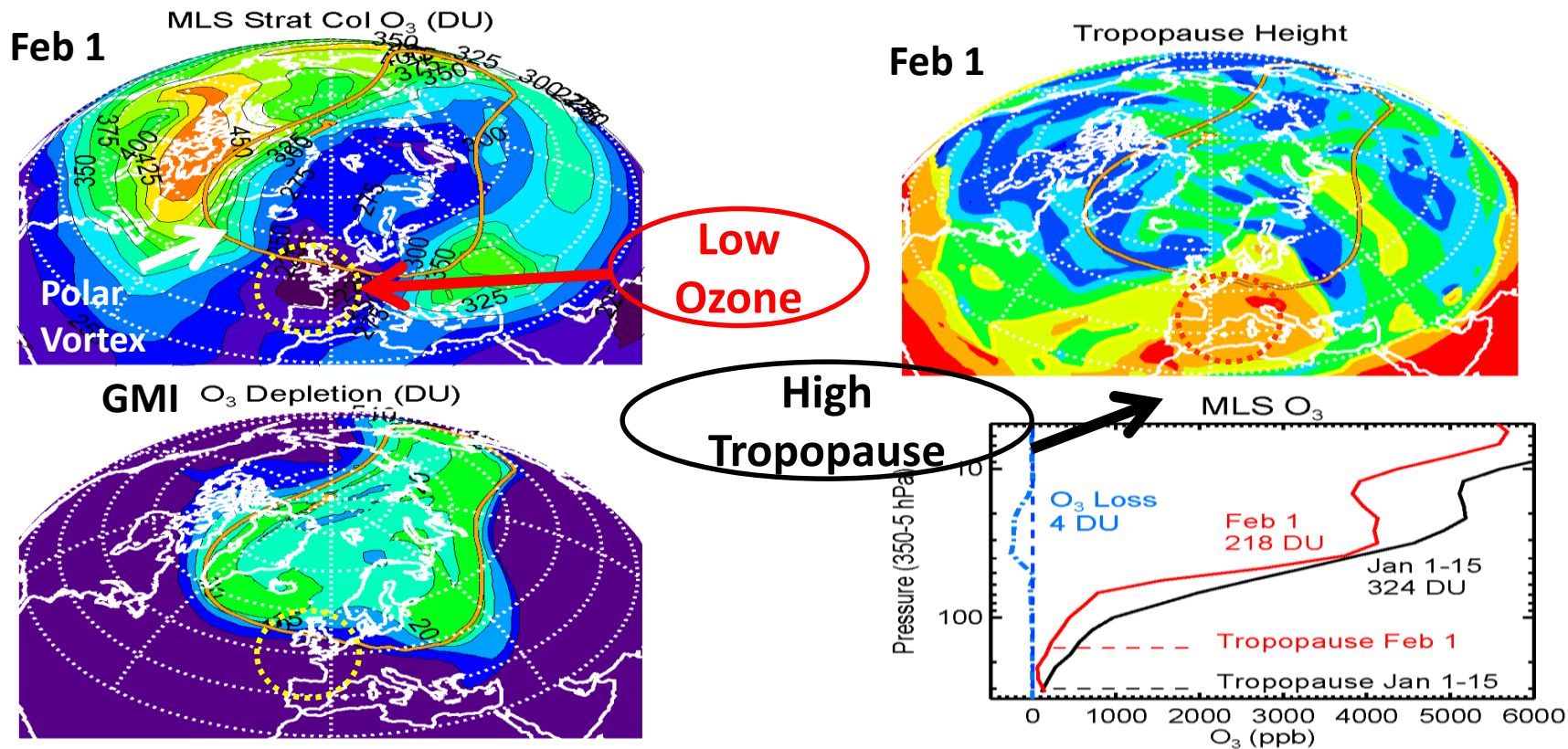


# Low Ozone over Europe doesn't mean the sky is falling, it's actually rising

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**Low column O<sub>3</sub> over Europe on February 1, 2016 was not caused by manmade substances.** The GMI model calculated 4 Dobson Units (DU) of O<sub>3</sub> depletion. The high tropopause, shown by MERRA, lifted the O<sub>3</sub> profile to lower pressures, causing the stratospheric column to decrease by more than 100 DU compared to earlier in winter. **The ozone was displaced, not depleted.**



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**Data Sources:** NASA Aura Microwave Limb Sounder (MLS) ( $O_3$  profiles and columns), NASA Global Modeling Initiative (GMI) Chemistry and Transport Model (calculated  $O_3$  depletion), and MERRA Tropopause Heights.

**Technical Description of Figures:** The left graphics show MLS northern hemisphere stratospheric column ozone on Feb. 1, 2016. Very low columns are seen over the UK and Europe (<225 DU, inside dashed circle). The lower graphic shows the GMI-calculated  $O_3$  depletion. It's very small, suggesting the low  $O_3$  does not indicate significant depletion. The right graphics show how the high tropopause height in this region explains the observed low ozone. The lower panel shows that the high tropopause on Feb. 1 lifts the  $O_3$  profile compared to a typical profile found earlier in winter. This motion lifts the profile to lower pressures thus reducing the total column. The GMI Model shows only 4 Dobson Units (DU) of  $O_3$  depletion even though the column is more than 100 DU lower than one month earlier.

**Scientific significant and societal relevance:** To quantitatively understand anthropogenic impacts to the stratospheric ozone layer, we must be able to distinguish between low ozone caused by ozone depleting substances and that caused by natural dynamical variability in the atmosphere. Observations and realistic simulations of atmospheric composition are both required in order to separate natural and anthropogenic ozone variability.